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PROCEEDINGS OF THE
ROYAL ENTOMOLOGICAL SOCIETY
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SERIES A. GENERAL ENTOMOLOGY

VOLUME 15. 1940.

THE INSECT FAUNA OF THE WASTE AREAS OF TILBURY DOCK

By H. M. EDELSTEN, F.R.E.S.

AT the request of the Ministry of Agriculture and Fisheries I undertook during the summer of 1938 a partial survey of the insect fauna of the Tilbury Dock area. By kind permission of the Trustees of the British Museum (Natural History) I was given the services of Mr. T. G. Howarth as assistant.

The main object of this survey was connected with the occurrence of the Colorado Beetle at Tilbury the previous year. It was thought possible that it might be found on the *Solanum dulcamara* which is a known food-plant of the larva and which occurs all over the waste ground in the dock area, but although this plant was thoroughly examined on each visit, no trace of the beetle or its larvae could be found.

The area surveyed comprises the whole of the Port of London Authority land within the Customs fence, a portion outside the fence to the north-west and a triangular piece between the Main Dock, Tidal Basin and the river, known locally as the Coaling Jetty (several hundred acres in all). The terrain is bordered on the south and west by the River Thames, on the east by the London, Midland and Scottish Railway, and on the north by the Grays Thurrock marsh.

In early days it must have been an extensive area of marshland, intersected by creeks and reedy ditches, of which very little trace now remains. The area not actually occupied by the docks and jetties has for years been used as a dump heap for rubbish, and when the docks were made some of the excavated soil was also spread there.

An embanked concrete road runs through the centre of the ground from Tilbury Dock Station right round to the Main Dock, and for part of the way it is bordered by the Dock railways.

Except for a few pools and hollows, the ground level is now considerably higher than formerly.

Almost the whole area has become colonised by waste-land plants, thistles being in the majority, though in places, hemlock grows in great masses. *Solanum dulcamara* is scattered over the whole of the ground, but some of it appeared to have been cut out within the last year or so.

With the exception of the pieces adjoining the railway lines, the embankment of the road, and various portions near buildings in the dock areas, very little mowing seems to be done, only so much as is necessary to prevent damage by grass fires and to keep the railway tracks clear.

For the purposes of the survey the ground was divided into four sections, viz.: the north and south sides of the concrete road, the Coaling Jetty piece and the allotment piece near Manor Way Gate.

The next consideration was the flora.

The north side consists of alternate hollows and raised ground. Reed grows in the hollows in some quantity, while on the higher portions thistles, teasels, hemlock and some *Lepidium draba* grow but rather more scattered than on the south side. At about the centre the ground falls away into a grassy hollow with a football field on the roadside and an area of blackthorn and hawthorn on the northern boundary. Farther west towards the river the ground rises again, where there is a mass of thistle, hemlock, ragwort and some teasel. *Solanum* is scattered over most of the higher portions.

On the south side there was a belt of *Carduus tenuiflorus* on the road bank. This gave way farther in to large masses of *Carduus lanceolatus*, hemlock and *Lepidium*. The ground falls towards a hollow in the middle where there are two reed-fringed pools. A raised cinder pathway divides the hollow. Around the pools is a grassy area dotted with small hawthorn and blackthorn bushes.

On the western side of the grassy area is a small tidal creek with some *Aster tripolium* growing in the north-west corner. The ground rises sharply beyond the creek, the western bank of which was covered with large masses of *Solanum dulcamara*. Farther west towards the lock was a very thick mass of hemlock, thistles and convolvulus. Beyond the lock was a triangular piece of ground, the flora of which was more varied and comprised *Helminthia echioides*, *Sinapis nigra* and *S. incana*, *Picris hieracioides*, *Convolvulus sepium*, *Rapistrum linneanum* var. *glabra*, *Lepidium draba*, *Carduus lanceolatus* and *C. arvensis*, *Artemisia vulgaris*, and *A. absinthium*, *Centranthus ruber*, *Lactuca virosa* (2 forms), *Clematis vitalba*, and some hawthorn, sallow, bramble, willow herbs and ragwort. Some *Solanum* grew on this piece.

The Coaling Jetty piece contained the richest flora of all the sections. Parts of it were open and grassy with rather a dwarfed plant-growth. Dotted about were bushes of elder, birch, hawthorn, blackthorn, sallow, sycamore, and clumps of bramble and *Clematis vitalba*. *Solanum dulcamara* grew more or less all over this section. There were three fair-sized patches of reed. Among the other plants observed were *Sinapis nigra* and *S. incana*, *Sisymbrium altissimum* (= *pannonicum*), *S. orientale* (= *columnae*), *Rapistrum linneanum* var. *glabrum*, *Helminthia echioides*, *Picris hieracioides*, *Lactuca virosa* (2 forms), *Carduus lanceolatus* and *C. arvensis*, *Centranthus ruber*, *Senecio viscosus*, *Vicia* species, burdock, hemlock, ragwort, mayweed, and teasel. The allotment piece was also fairly rich in plant life, open and grassy at the Manor Way Gate end with a few seedling birches, sallows, clumps of bramble and a strip of reed in the middle. At the northern end were a number of allotments.

Many of the bushes of *Salix caprea* to the north of the concrete road near the railway lines were infested with a gall which has a different appearance from that on *Salix alba*. Dr. A. M. Massee has identified it as *Eriophyes triradiatus* (*typicus*) Nalepa.

On 25 May I went to Tilbury, where I was met by Messrs. Buckhurst, Strang and Thomas, who pointed out to me the area to be examined on either side of the concrete road. Near Manor Way Gate there are some allotments, which were carefully examined on each subsequent visit, but without result.

On 13 and 14 June the north and south sections and the allotment piece were thoroughly explored. About 20 species of Lepidoptera and Coleoptera were noticed. *Plutella maculipennis* was abundant among *Lepidium*. *Myelois cribrella* and *Loxostege verticalis* were common among thistles. The blackthorn and hawthorn bushes on the western side of the north-west section were almost defoliated by larvae of *Hyponomeuta padella*, which were in immense numbers. They were, however, heavily parasitised. Cuckoos in some numbers were frequenting the bushes. It is possible that they were feeding on the larvae.

From 17 to 19 June all sections were visited. With Mr. Howarth's help the sections north and south of the road were also worked at night. Both sugar and light were tried. Last year's teasel stems, cut and stuck up every few yards, for want of anything better to put the sugar on, proved quite attractive. About 60 species of Lepidoptera, including 1 *Nomophila noctuella*, were noticed.

On 18 June while visiting the allotment piece at about 6 p.m. 3 specimens of *Trichius abdominalis* Men. were found. Two of them were in Convolvulus blossoms and one in a bramble blossom.

From 8 to 10 July all sections were again visited. It was decided to inspect the Coaling Jetty section, which is situated outside the Customs fence and adjoins the river. Incidentally a large number of steamers put in there to coal; therefore it appeared to be a likely place for any imported species to land. We worked this piece on both nights with sugar and light, using teasel heads and straw bottle-cases and drift wood collected from the fore-shore for the sugar. A large number of species of both macro- and micro-lepidoptera were observed, but no alien species. The weather conditions on 9 July were against us. It was difficult to find any shelter from the wind, consequently the bag was a very small one.

All sections were visited from 29 to 31 July. The Coaling Jetty piece was worked at night on 29 July. This was our best night, a very large number of species being observed. One specimen of *Loxostege palealis* was taken. On the night of 30 July we worked the south side of the road, but weather conditions were bad, consequently only a few of the more robust macrolepidoptera were seen.

All sections were visited from 27 to 29 August. In addition we explored the ground outside the Customs fence to the north-west, walking from Tilbury Dock Station along the Dock Railway to the North End Gate and then turning west towards the river. At the river-side of this section there is quite a big hill of old dumped refuse. This has now become covered with waste-land plants.

Larvae of *Loxostege palealis* were abundant on *Daucus carota* growing on the grassy portions just before we reached the hill. We decided to work the Coaling Jetty piece on the night of 27 August, but on arrival there found that an extensive grass fire had set light to the old coal refuse dumped there some years ago. The fire was burning underground and had already destroyed most of the plant growth on the western half of this section. As it was then too late to get to any of the other sections, we were forced to confine ourselves to a small corner at the south-eastern end, which was away from the smoke, but rain coming on rather heavily put an end to collecting. 1 *Nomophila noctuella* was taken on this section.

The section north of the concrete road was worked on the night of 28 August. Numbers of common species were noted but *Amathes xanthographa* was the principal visitor to the sugar and *Luperina testacea* to the light. It became cool and foggy about midnight, so we had to leave.

There was nothing very striking among the Rhopalocera. Several *Argynnis cydippe* were seen. *Vanessa cardui*, though observed in some numbers in May, was scarce in August and no larvae or pupae were found. One fresh *Colias croceus* was found on 29 August. The Essex Skipper *Adopoea lineola* was abundant on the grassy portions.

Among the Heterocera, it was interesting to find that many of the species formerly associated with the Thames marshland such as *Nonagria geminipuncta*, *N. dissoluta* and ab. *arundineta*, *Rhizedra lutosa*, *Arenostola phragmitidis*, *Leucania obsoleta*, *L. straminea* and *Chilodes maritima*, still occurred among the reeds at Tilbury. The typical black *N. dissoluta* seems to be far more plentiful than the ab. *arundineta* in this locality, about 10 *dissoluta* to 1 ab. *arundineta* were bred from collected larvae. *Triphaena pronuba* was in immense numbers and very variable. *T. interjecta* was also plentiful, flying swiftly round the bushes at dusk and as usual difficult to catch. *Procus bicoloria* swarmed at dusk and afterwards at sugar. Two specimens of *Apamea oblonga* came to sugar near the sea-wall.

We quite expected to see *Laphygma exigua* but it did not appear.

The most interesting Geometridae were *Hemistola chrysoprasaria*, *Horisme vitalbata* and *H. tersata*, no doubt living amongst the *Clematis vitalba*, *Scopula immutata* in the marshy places and the black ab. *rebeli* of *Cleora rhomboidaria*.

The Pyralidinae were quite interesting. A rather curious-looking *Ephestia elutella*, *Homoeosoma sinuella* which I hardly expected and *H. binaevella*. *Myelois cribrella* was very common; the larvae must control the spear thistle to some extent. In August there was hardly a flower-head without a larva. *Eurhodope advenella* and *E. suavella* turned up at light. A few *Nomophila noctuella* were seen and larvae of *Loxostege palealis* were common in heads of *Daucus*. *L. verticalis* was abundant. About 58 species of microlepidoptera were noticed. Those nice species: *Polychrosis fuligana*, *Eucosma conterminana* among the *Lactuca* and *E. pupillana*, which I had previously only seen from Portland among the *Artemisia absinthium*. Some fine *Eucosma foenella* were bred from larvae found in the roots of *Artemisia vulgaris*. *Phthorimaea costella* larvae were mining the terminal shoots of *Solanum* and were parasitised by a species of *Rhysipolis* (Braconidae). *Plutella maculipennis* was abundant among *Lepidium draba*: the larvae were much parasitised by *Angitia fenestralis* (Grav.) (Ichneumonidae).

We found Coleoptera rather scarce, possibly owing to the drought; sweeping produced very little except the *Solanum* flea beetles *Psylliodes dulcamarae* and *P. affinis*; shaking heaps of mown grass and rubbish on the banks was also unproductive; it was too dry, and rather too full of thistle stems. The most interesting capture was three specimens of the pretty chafer *Trichius abdominalis* on 18 June. It was not possible to do much with other orders but a few Hymenoptera, Hemiptera–Heteroptera, and Hemiptera–Homoptera and Diptera were noted.

List of Insects Observed.

Rhopalocera.

Satyridae.

Maniola jurtina (L.).
Coenonympha pamphilus (L.).

Nymphalidae.

Argynnis cydippe (L.).
Vanessa atalanta (L.).
V. cardui (L.).
Aglais urticae (L.) and larvae.
Nymphalis io (L.).

LYCAENIDAE.

Polyommatus icarus (Rott.).
Lycaena phlaeas (L.).

PIERIDAE.

Pieris brassicae (L.).
P. rapae (L.).
P. napi (L.).
Colias croceus (Fourcroy).

HESPERIIDAE.

Adopoea lineola Ochs. Common.
Ochlodes venata B. & G.

Heterocera.

ARCTIIDAE.

Spilosoma lubricipeda (L.). (White ermine).
S. lutea (Hufn.). (Buff ermine).
Arctia caja (L.).
A. villica (L.).
Callimorpha jacobaeae (L.).

NOTODONTIDAE.

Cerura vinula (L.) (and larvae).
Phalera bucephala (L.).
Malacosoma neustria (L.) (and larvae).

LASIOCAMPIDAE.

Philudoria potatoria (L.) (and larvae).

AGROTIDAE.

Cryphia perla (Fab.).
Agrotis segetum Schiff.
A. radius Haw.
A. exclamationis (L.).
A. ipsilon (Rott.).
Euxoa nigricans (L.).
Amathes c. nigrum (L.).
A. xanthographa (Fab.).
Diarsia rubi (View.).
Ochropleura plecta (L.).
Axylia putris (L.).
Triphaena comes (Hübn.).
T. pronuba (L.).
T. ianthina (Esp.).
T. interjecta (Hübn.).
Mamestra brassicae (L.).
Melanchra persicariae (L.).
Diataraxia oleracea (L.) and larvae.
Hadena suasa (Schiff.).
H. trifolii (Rott.) and larvae.
Ceramica pisi (L.) and larvae.
Tholera popularis (Fab.).
Luperina testacea (Hübn.).
Thalpophila matura (Hufn.).
Apamea oblonga (Haw.).
A. obscura (Haw.).
A. basilinea (Schiff.).
A. secalis (L.).
A. lithoxylea (Fab.).
A. monoglypha (Hübn.).
Procus strigilis (Clerck).
P. latruncula (Schiff.).
P. fasciuncula (Haw.).
P. literosa (Haw.).
P. bicoloria (Vill.).
Euplexia lucipara (L.).
Phlogophora meticulosa (L.).
Hydroecia micacea (Esp.).

Gortyna flavago (Schiff.).
Nonagria geminipuncta (Haw.) (larvae).
N. dissoluta Tr. (larvae).
N. d. ab. *arundineta* Schmidt. (larvae).
Chilodes maritima (Tausch.).
Rhizedra lutosa (Hübn.) (larvae).
Arenostola phragmitidis (Hübn.) (and larvae).
Leucania pallens (L.).
L. impura (Hübn.).
L. straminea Tr. (and larvae).
L. obsoleta (Hübn.).
L. lithargyria (Esp.).
L. conigera (Fab.).
Meristis trigrammica (Hufn.).
Caradrina morpheus (Hufn.).
C. alsines (Brahm).
C. quadripunctata (Fab.).
Rusina umbratica (Goeze).
Amphipyra tragopoginis (L.).
Plusia chrysitis (L.).
P. gamma (L.).
Euclidimera mi (Clerck) (and larvae).
Hypena proboscidalis (L.).
Zanclognatha tarsipennalis (Tr.).

GEOMETRIDAE.

Hemistola chrysoprasaria (Esp.).
Sterrha seriata (Schr.).
S. fuscovenosa (Gze.).
S. aversata (L.).
S. biselata (Hufn.).
S. dimidiata (Hufn.).
Scopula immutata (L.).
Ortholitha chenopodiata (L.).
Anaitis plagiata (L.).
Xanthorhöe spadicearia (Schiff.).
X. montanata (Schiff.).
X. fluctuata (L.).
Epirrhöe alternata (Mull.).
Euphyia bilineata (L.).
Eupithecia haworthiata Dbldy.
E. linariata (Fab.).
E. centaureata (Schiff.).
E. succenturiata (L.).
Horisme vitalbata Schiff.).
H. tersata (Schiff.).
Abraxas grossulariata (L.).
Cabera pusaria (L.).
Selenia bilunaria (Esp.) 2 gen. *illunaria* (Esp.).
Crocallis elinguaria (L.).
Opisthograptis luteolata (L.).
Biston betularia (L.) (and larva).
Cleora rhomboidaria (Schiff.).
C. r. ab. *rebeli* (Aign.).
Aspilates ochrearia (Rossi.).

ZYGAENIDAE.

Zygaena filipendulae (L.) (1 cocoon).

Pyralidina.

PHYCITIDAE.

Ephestia elutella (Hübn.).
Homoeosoma sinuella (Fab.).
H. binaevella (Hübn.).
Myelois cribrella (Hübn.) (very common and larvae).
Eurhodope advenella (Zinck.).
E. suavella (Zinck.).

CRAMBIDAE.

Crambus pascuellus (L.)
C. pratellus (L.).
C. culmellus (L.).
C. hortuellus (Hübn.).
C. perlellus (Scop.).
C. geniculeus (Haw.).
C. tristellus (Fab.).
Chilo phragmitellus (Hübn.).

Pyraustidae.

Phlyctaenia prunalis (Schiff.).
P. sambucalis (Schiff.).
Nomophila noctuella (Schiff.)
Loxostege verticalis (L.) (common).
L. palealis (Schiff.) (larvae common).
Scoparia cembrae Haw.
Mesographe forficalis (L.).
Endotricha flammealis (Schiff.).

Microlepidoptera.

Pterophoridae.

Platyptilia gonodactyla Schiff.
P. pallidactyla Haw.
Alucita pentadactyla L.
Pterophorus monodactyla L.

Phaloniidae.

Phalonia tesserana Treits.
P. roseana L.
P. atricapitana Steph.
P. pallidana Zell.
P. hybridella Hübn.
Euxanthis hamana L.

Tortricidae.

Pandemis ribeana Hübn.
Tortrix paleana Hübn.
T. unifasciana Dup.
Cnephasia vigaureana Treits.
Peronea asperana Hübn.
P. variegana Schiff. ab. *fuscana* Sheldon.

Eucosmidae.

Spilonota ocellana Fab.
Notocelia uddmanniana L.
Eucosma nigromaculana Haw.
E. citrana Hübn.
E. pupillana Clerck.
E. conterminana H.-S.
E. cana Haw.
E. foenella L.
E. brunnichiana Froel.
E. tripunctana Fab.
Polychrosis fuligana Haw.
Argyroploce pruniana Hübn.
A. lacunana Dup.
A. urticana Hübn.
Hemimene petiverella L.
H. simpliciana Haw.
H. plumbana Scop.
H. saturnana Guen.
Laspeyresia compositella Fab.

Gelechiidae.

Metzneria metzneriella Staint.
Gelechia mulinella Zell.
Phthorimaea obsoletella Fisch.
P. costella Westwd. (Parasite *Rhysipolis* sp. probably new.)
Brachmia gerronella Zell.
B. rufescens Haw.

Cosmopterygidae.

Chrysoclista hellerella Dup.

OECOPHORIDAE.

Carcina quercana Fab.
Depressaria weirella Staint.
D. badiella Hübn.
D. alstroemeriana Clerck.

GLYPHIPTERYGIDAE.

Simaethis fabriciana L.

ELACHISTIDAE.

Elachista atricomella Staint.

HYPONOMEUTIDAE.

Argyresthia nitidella Fab.
Hyponomeuta padella L.

COLEOPHORIDAE.

Coleophora nigricella Steph.
C. glaucicolella Wood.

GRACILARIIDAE.

Lithocolletis viminella Staint.
Acrocercops omissella Staint.

PLUTELLIDAE.

Plutella maculipennis Curt. (Parasite *Angitia fenestralis* Holmgr.)

TINEIDAE.

Monopis ferruginella Hübn.
Tinea pallescentella Staint.
Ochsenheimeria bisontella Hübn.

HEPIALIDAE.

Hepialus lupulinus L.
H. sylvinus L.

Coleoptera.

CARABIDAE.

Dichirotrichus pubescens (Pk.).
Calathus melanocephala (L.).
Dromius linearis (Ol.).
D. nigriventris Th.
Ophonus pubescens (Mull.).
O. ardosiacus Luts.
Pterostichus madidus (Fab.).
Harpalus tardus (Pz.).
Amara lunicollis Sd.

STAPHYLINIDAE.

Tachyporus chrysomelinus (L.).
Quedius molochinus (Gr.).
Staphylinus olens Ml.

COCCINELLIDAE.

Coccidula scutellata (Hbst.).
Rhizobius litura (Fab.).
Coccinella 7-punctata (L.).
C. 10-punctata ab. *bimaculata* (L.).
C. 11-punctata (L.).
Subcoccinella 24-punctata (L.).
Thea 22-punctata (L.).

NITIDULIDAE.

Brachypterus glaber Steph.
Meligethes aeneus (Fab.).
Pria dulcamarae (Sc.).

BYTURIDAE.

Byturus tomentosus (Fab.).

SCARABAEIDAE.

Trichius abdominalis Men.

ELATERIDAE.

Agriotes sputator (L.).

CANTHARIDAE.

Malachius viridis Fab.
Cantharis pallida (Gze.).
C. rustica Fln.
Rhagonycha fulva (Sp.).
Silis ruficollis (Fab.).

CHRYSOMELIDAE.

Psylliodes dulcamarae Koch.
P. affinis (Payk.).
Phaedon tumidulum Gm.
Cassida rubiginosa Mull.
Crepidodera ferruginea Scop.

OEDEMERIDAE.

Oedemera lurida (Mm.).
Nacerda melanura (L.).

CURCULIONIDAE.

Dorytomus dejeani Fst.
Apion radiolus K.
A. aeneum Fab.
A. carduorum K.
Phyllobius viridacris Laich.
Otiorrynchus ovatus L.
Ceuthorrynchus litura Fab.
C. pollinarius Först.

Hemiptera–Heteroptera.

PENTATOMIDAE.

Sehirus bicolor (L.) nymphs.
Gnathoconus albomarginatus Goeze.

TINGIDAE.

Tingis cardui L.

NABIDIDAE.

Nabis major Costa nymph.

ANTHOCORIDAE.

Anthocoris nemorum (L.).

CAPSIDAE.

Brachyceraea errans (Wolff).
Phytocoris varipes Boh.
Capsus ater L.
Liocoris tripustulatus Fab.
Lygus campestris L.
Heterotoma meriopterum Scop.
Plagiognathus arbustorum Fab.

Hemiptera–Homoptera.

DELPHACIDAE.

Asiraca clavicornis Fab.

PSYLLIDAE.

One sp. indet.

Hymenoptera.

VESPIDAE.

Ancistrocerus albotricinctus (Zett.).

ICHNEUMONIDAE.

Angitia fenestralis (Holmgr.).
Banchus volutatorius (L.).
Glypta bicornis Boie.
Pimpla spuria Grav.
Goniocryptus plebejus Tschek.

BRACONIDAE.

Microgaster sp.
Rhysipolis sp.

Diptera.

ASILIDAE.

Dioctria atricapilla Mg.

THEREVIDAE.

Thereva ? nobilitata Fab.

STRATIOMYIIDAE.

Nemotelus notatus Zett.

Microchrysa polita L.

SYRPHIDAE.

Eristalis aeneus Scop.

TRYPETIDAE.

Trypeta florescentiae L.

The total number of species observed is :—

Rhopalocera	15
Heterocera	183
Coleoptera	46
Hemiptera–Heteroptera	12
Hemiptera–Homoptera	1
Hymenoptera	8
Diptera	6
	271

I wish to thank my colleagues at the British Museum (Natural History) for their help in identifying the various species and plants and Mr. T. G. Howarth for drawing a botanical map.

BOOK NOTICE.

Nature Parade. By F. W. LANE. pp. 316, 63 pls. 8vo. London (Jarrolds). (1939.) Price 15*s.*

This book contains 14 chapters arranged in 3 sections. The first is entitled Private Lives and comprises the chapters on Food, Toilet, Sleep, Leadership, Strength, War and Doctoring. The second is entitled Speed and Locomotion with the chapters on Animals, Fish, Birds, Insects, and Out of their element. The third and last has but two chapters on Animals we never see alive because they are rare or mysterious.

The author has " . . . attempted a synthesis of the more unusual observations which have been made . . . by naturalists, explorers, scientific workers, and chance observers of animals in all parts of the world." It will therefore be understood that the book has a " popular " appeal.

Among some of the statements here brought together attention may be directed to the tables of comparative speed. It is unfortunate that the table of speed of " insects " opens with the speed of a burrowing earthworm and includes several Mollusca, but it is well to know where to find such an attempt at cataloguing the speed of movement of animals.

Book Notice.

The Louse. An account of the Lice which infest man, their medical importance and control. By P. A. Buxton. pp. ix + 115, 28 figs. 8vo. London (Arnold). (1939.) Price 7*s.* 6*d.*

This book is concerned with *Pediculus humanus* and *Phthirus pubis.* It comprises 6 chapters as follows : The Anoplura or Sucking Lice; The Anatomy of *P. humanus*; The Biology of *P. humanus*; The medical importance of *P. humanus*; The control of *P. humanus*; and The Crab Louse (*Phthirus pubis*). An appendix deals with methods of rearing and methods of feeding and infecting lice by rectal injection. A list of references extending to 7 pages and index complete the volume.

The book was originally written as part of a larger work on medical entomology designed for readers with some knowledge both of entomology and medicine. The author has, however, attempted to make it comprehensible to those who lack the one or the other. In the belief that to control an insect, full general knowledge of all parts of its life must be available, attention is concentrated more on the biology than the anatomy of the louse.

Book Notice.

Grassroot Jungles. A book of Insects. By E. W. Teale. 8vo. London (Putnam) [n.d.]. pp. xii + 233, 130 figs. Price 15*s.*

In this book are illustrations of many everyday insects of North America. Most of the pictures are greatly enlarged and thereby give a wealth of detail not normally visible to the average person. The half-tone reproductions are excellent and the collection reproduced is but a small selection from the thousands of negatives made by the author.

A narrative written in popular style serves as a background to the pictures.

Book Notice.

The Mind of the Bees. By J. Françon. Translated by H. Eltringham. 8vo. London (Methuen) (1939). pp. xi + 146, 11 figs. Price 6*s.*

This book is translated from the French. It tells the results of personal observations and experiments to discover what bees can do. The sections of the book are : the methodical organisation of the work of the bees; memory, sense of orientation and survey; bees and colours; and intercommunication between the bees.

The translator in his preface says : " At a time when even the vocabulary of Science is a mystery to the uninitiated, it is a joy to find a work which can be read with intelligence and delight by a child and yet contains material of the greatest scientific interest."

PHENOLOGICAL OBSERVATIONS ON THE BRIMSTONE BUTTERFLY, *GONEPTERYX RHAMNI* (LINN.) (LEPID.)

By G. Fox-Wilson, N.D.H., F.R.E.S., F.L.S.
(*R.H.S. Laboratory, Wisley.*)

This familiar butterfly is the first of the hibernating species to appear in early spring, and it has been suggested that the date of the first re-appearance of this species at the Royal Horticultural Society's Gardens, Wisley, Surrey, over a period of twenty years should be placed on record.

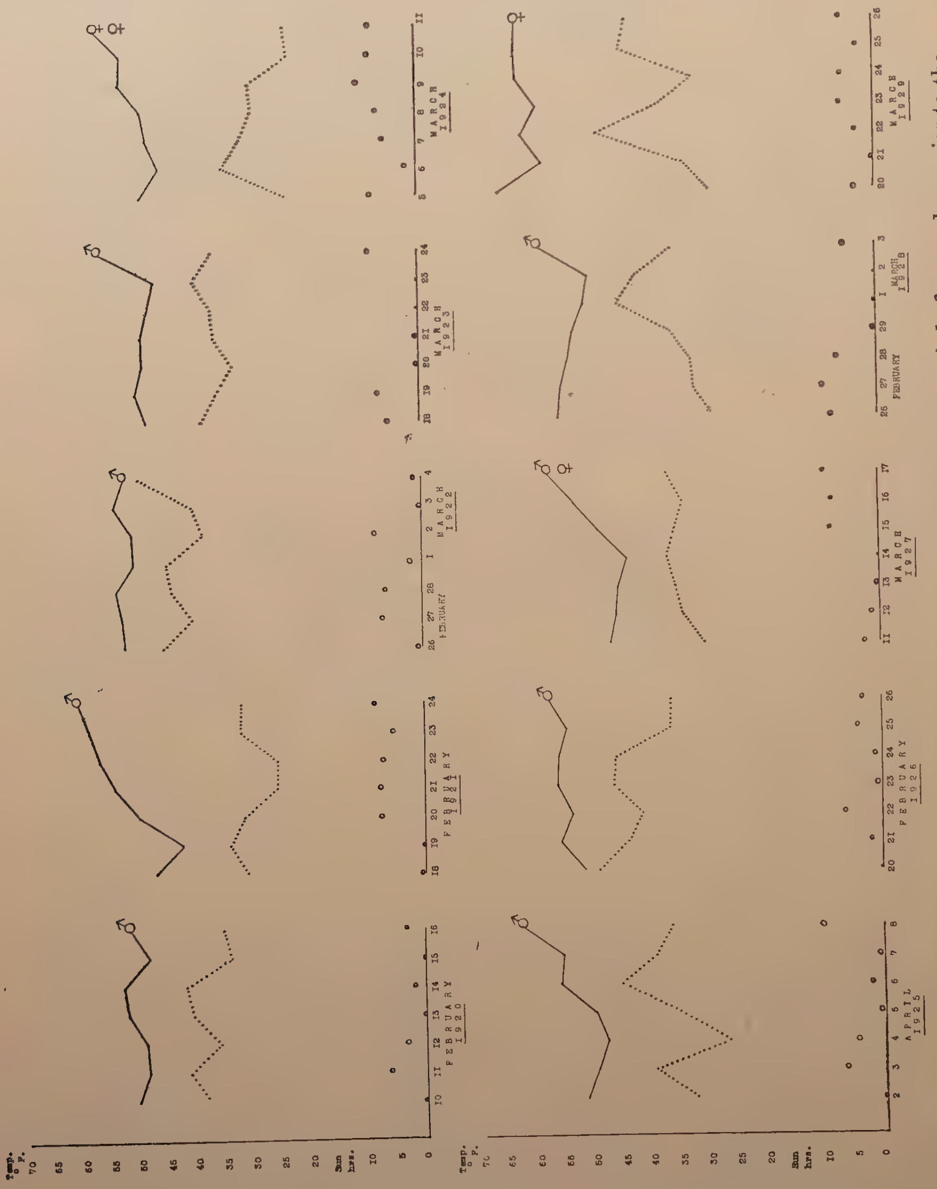
The first specimen of this so-called "editorial butterfly" to appear at Wisley is along the edge of a mixed Larch and Scot's Pine wood sloping due south, and hibernated specimens are usually to be found in certain large Holly trees which grow along the outer rim of this wood and in clumps of Ivy on some ancient Oak trees, both of which plants provide hibernacula.

This butterfly commences to fly regularly about mid-April, but in some years it has been found at Wisley on the wing in mid-February (1896, 1920), and even in December (19th Dec. 1932). It has been stated (Thompson, 1934) that a temperature of 60° F. is necessary to awaken a torpid insect, and that this temperature in winter is very fugitive, for any obscurity of the sun by cloud lowers the temperature and, incidentally, reduces the vigour of the insect. Our records show that the torpid Brimstone frequently re-awakens and becomes active on the wing at temperatures below 60° F. (*vide* Meteorological Charts).

To attempt to forecast the date of emergence of *G. rhamni* from hibernation on data based solely on the maximum day temperature is not possible; for other factors, namely the minimum night temperatures and hours of sunlight over a period of a few days prior to its re-appearance, are concerned with the renewed activity of the species. There is, of necessity, a pre-period of "warming-up" necessary to awaken the torpid insect and to induce it to leave the shelter of its hibernaculum. For instance, in 1929, the first appearance of this butterfly was on the 26th March, but an examination of the meteorological data shows that a higher maximum temperature (66° F.) was recorded on the 20th March but the minimum temperatures at this time and for a period of days prior to the 20th were low compared with those prevailing immediately prior to its re-appearance on the 26th March.

It has been mentioned that this butterfly (♂) was on one occasion seen flying in December, and this insect had been subjected to a period of "warming-up" when the maximum day temperatures during the week prior to its appearance ranged from 49–55° F., with minimum night temperatures of 29·5–49° F., with two bright days (3·6 and 2·1 hours of sunshine respectively) immediately prior to its emergence.

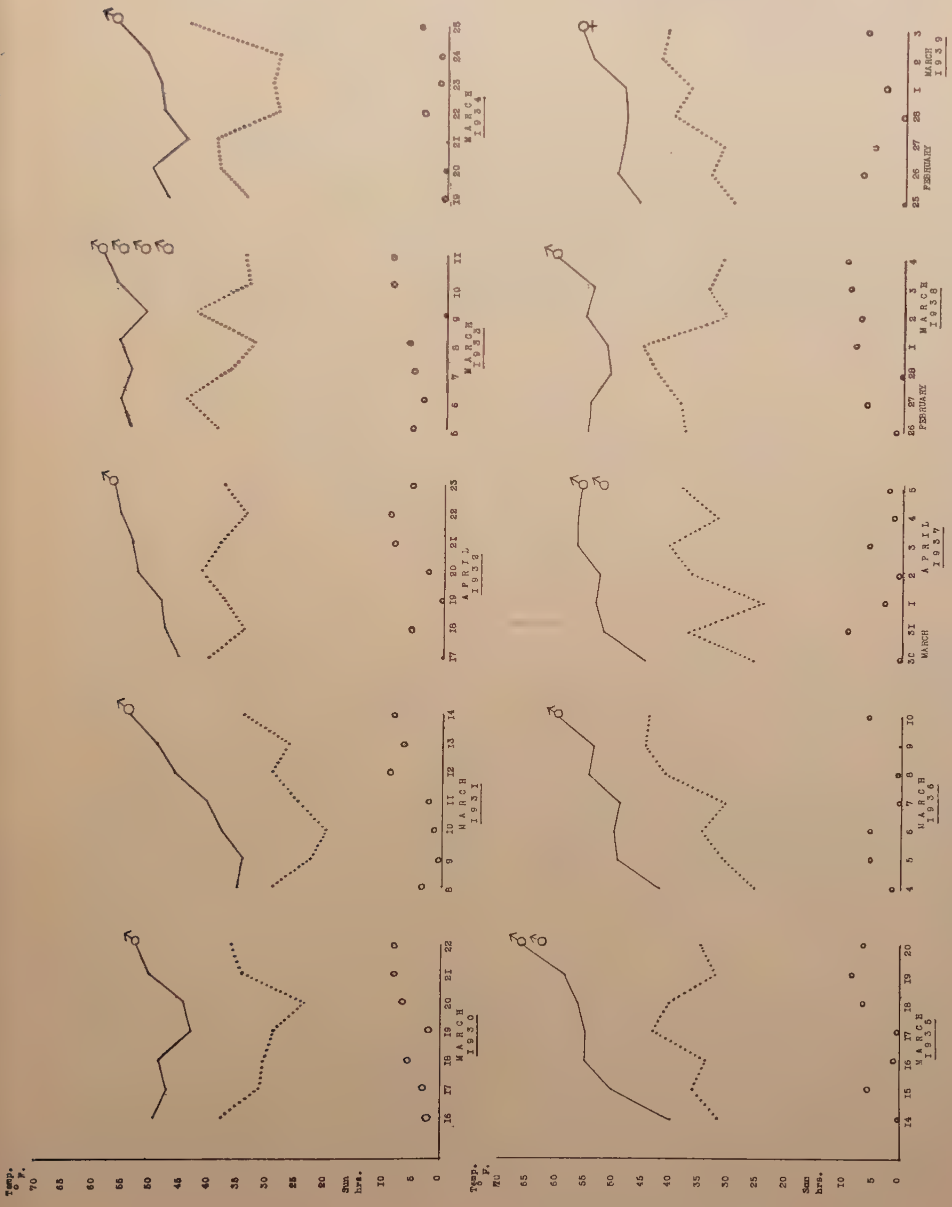
Records of the first re-appearance of the Brimstone butterfly have been taken at Wisley over a period of twenty years (1920–1939), and these have been correlated with the maximum and minimum temperatures and hours of sunshine for a period of seven days prior to the emergence from hibernation. Information, though available, of other meteorological data—relative humidity readings and rainfall—is not given, for a study of such data appears to show no effect on the awakening process of the torpid insect. The factors that influence the re-appearance of the species are temperature and illumination, the former including the maximum and minimum temperatures over a period of a few days prior to the spring advent, and the latter indicating sunlight, for never has the first butterfly at Wisley been observed flying on a sunless day even though the maximum and minimum temperatures have been favourable for such an event.



Maximum and minimum temperatures and amount of sunshine for a period of seven days prior to the first appearance of *G. rhamni* 1920–1929.

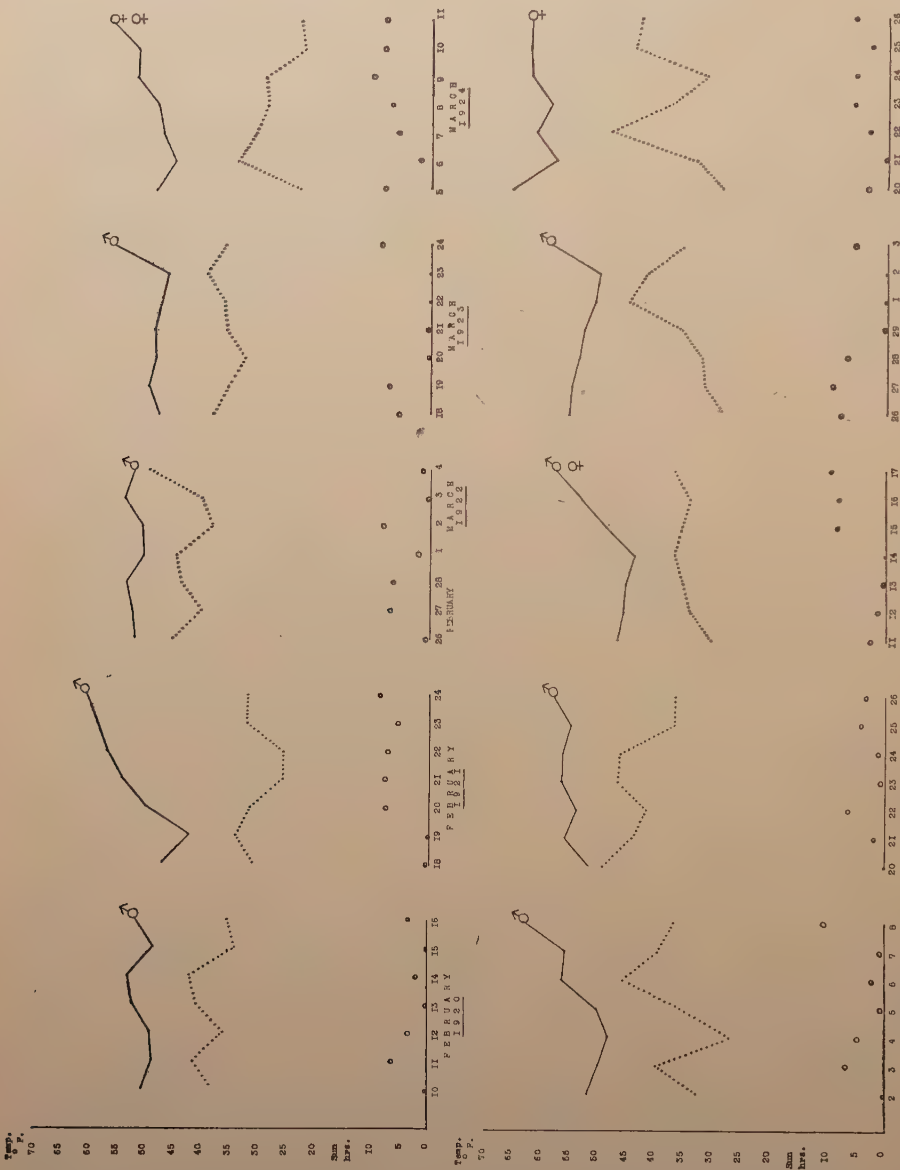
Some earlier records of the first appearance of this butterfly at Wisley were found and are herewith given. These records were made by the gardener (1909) of the late Mr. G. F. Wilson (the former owner of the Wisley Gardens), but it is not possible to give information concerning weather conditions prevailing over this period of years.

1891	17th April.
1892	25th February.
1893	19th February.
1894	25th March.
1895	10th April.
1896	11th February.
1897	18th February.
1898	no date
1899	13th March.
1900	10th March.
1901	no date
1902	6th March.



Maximum and minimum temperatures and amount of sunshine for a period of seven days prior to the first appearance of *G. rhamni* 1930–1939.

the maximum and minimum temperatures over a period of a few days prior to the spring advent, and the latter indicating sunlight, for never has the first butterfly at Wisley been observed flying on a sunless day even though the maximum and minimum temperatures have been favourable for such an event.



Maximum and minimum temperatures and amount of sunshine for a period of seven days prior to the first appearance of *G. rhamni* 1920–1929.

Some earlier records of the first appearance of this butterfly at Wisley were found and are herewith given. These records were made by the gardener (1909) of the late Mr. G. F. Wilson (the former owner of the Wisley Gardens), but it is not possible to give information concerning weather conditions prevailing over this period of years.

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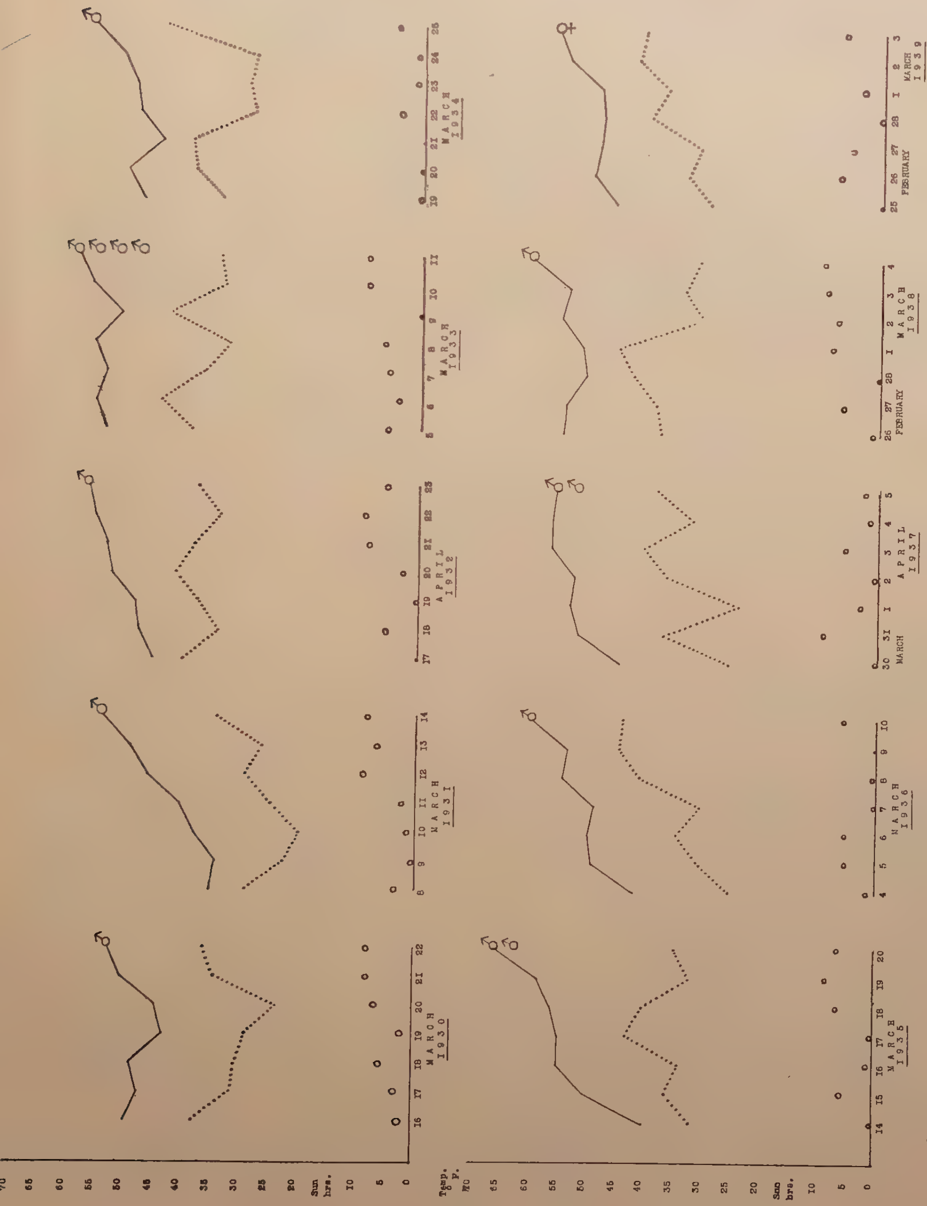


Maximum and minimum temperatures and amount of sunshine for a period of seven days prior to the first appearance of *G. rhamni* 1930–1939.

YEARS 1920–1939.

1920	16th February	♂.
1921	24th February	♂.
1922	4th March	♂.
1923	24th March	♂.
1924	11th March	♀♀.
1925	8th April	♂.
1926	26th February	♂.
1927	17th March	♂♀.
1928	3rd March	♂.
1929	26th March	♀.
1930	22nd March	♂.
1931	14th March	♂.
1932	23rd April	♂.
1933	11th March	♂♂♂♂.
1934	25th March	♂.
1935	20th March	♂♂.
1936	10th March	♂.
1937	5th April	♂♂.
1938	4th March	♂.
1939	3rd March	♀.

SUMMARY.

The dates of the first re-appearance of the Brimstone butterfly at the Royal Horticultural Society's Gardens, Wisley, Surrey, are given for a period of twenty years.

The meteorological data—maximum and minimum temperatures and hours of sunshine—over a period of seven days prior to the appearance of this species each year are set out, and indicate the effect of a pre-period of " warming-up " that is essential to awaken the torpid insect.

REFERENCES.

THOMPSON, A. R., 1934, *Nature by day* : 140–141.
1909, *J. R. hortic. Soc. Gardens Club* 2 : 28.

BOOK NOTICE.

Classified Index of Entomological Contributions to the *Scottish Naturalist* from its commencement in 1871 to the end of 1938. By P. H. GRIMSHAW. 8vo. (Scottish Naturalist, 1939.) pp. 65. Price 2*s.*

This classified index appeared in several parts in the *Scottish Naturalist.*

It is arranged by Orders and Families of insects, and the entries under each heading are arranged alphabetically by authors. The number of entries indexed is approximately 1250; entries of interest to more than one Order are usually repeated. Special note is made of all Vice-County records and a list of the Vice-Counties concerned is given in the introduction.

THE SEXUAL RATIO OF THE COMMON EARWIG, *FORFICULA AURICULARIA* L. (DERMAPT.), AS OBSERVED IN TRAP BANDS

By G. Fox-Wilson, N.D.H., F.R.E.S., F.L.S.
(*R.H.S. Laboratory, Wisley.*)

The gregarious habits of the Common Earwig, *Forficula auricularia* L., have been mentioned by various authors (Burr, 1939; Lucas, 1920; Worthington, 1926), and this note deals exclusively with this characteristic.

During August, September and October it is common to find assemblages, often very large, of Earwigs hiding in suitable crevices, for instance, in the uppermost internodal area of Bamboo support-canes (fig. 1), and beneath old grease-bands and corrugated-paper and sack-bands, both of which are frequently placed on the stem of standard and half-standard fruit trees for the capture of the apterous ♀♀ of various "Winter Moths," and for the trapping of the adult Apple Blossom weevil, *Anthonomus pomorum* (L.), and/or the larvae of the Codling moth, *Cydia pomonella* (L.)

It is the practice at the Royal Horticultural Society's Gardens at Wisley to allow the grease-bands to remain on the stem of certain standard fruit trees (19 Apples, 10 Pears, 6 Plums—*vide* Plan) for twelve months. These bands are removed during early October each year, and are replaced by fresh bands some days later. It was found that large numbers of sexually mature Earwigs congregated beneath the old bands, and it has been our practice to collect the insects annually and to ascertain the sexual ratio of the adults (Table I and Graph).

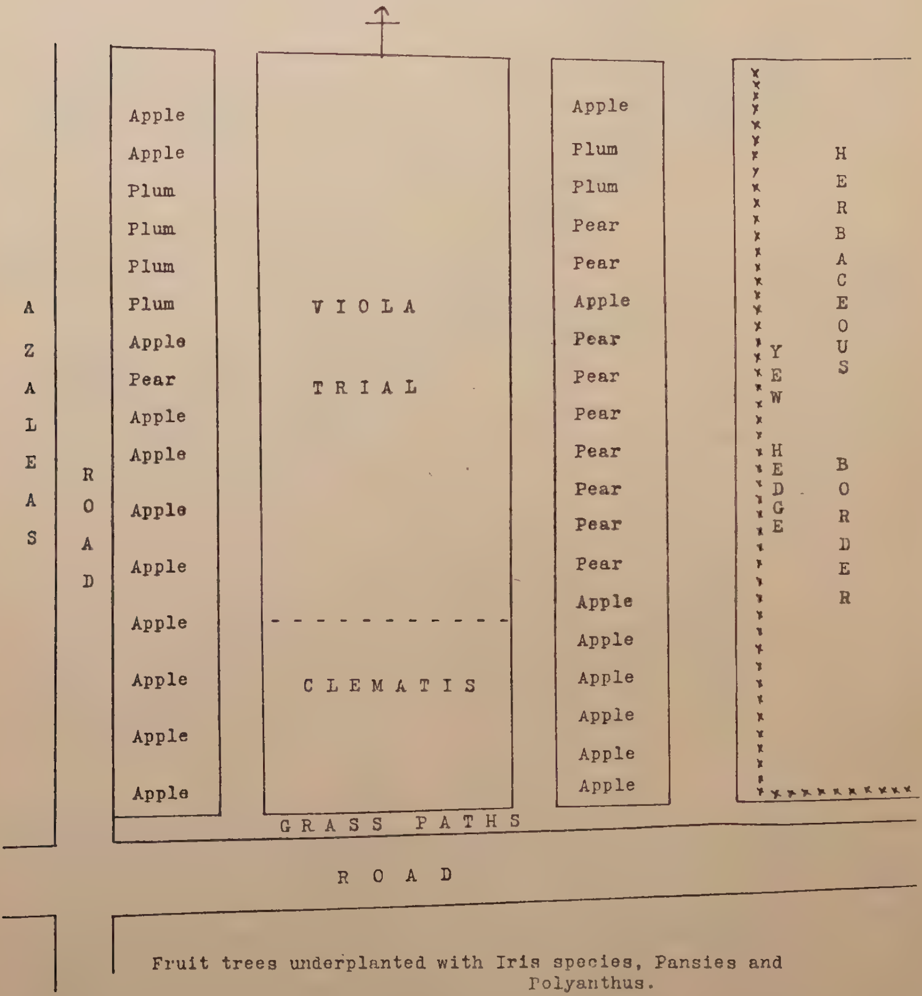
A number of macrolabious forms—generally referred to as the variety *forcipata*—are found each year, and their number appears in Table I. Among the colonies are to be found a certain number of individuals with abnormal callipers, especially among the males. It is suggested that this abnormality is due to the cannibalistic or fighting habits of the species.

In considering the senses of the Common Earwig, Burr (1939) states that thigmotropism is stronger even than the negative phototropism to which they react, and states: "There is certainly connection between this thigmotropism and their gregarious habits. In everyday language, we should say that they derive a feeling of comfort from the contact of their kind." The dominant stimulus is, therefore, tactile.

It will be noted (Table I) that the number of Earwigs found beneath the bands in 1935 and 1938 † was the lowest on record; this being due to the stripping of the bands in July by birds, especially Jays and Great Tits, which were seeking the larvae of the Cherry Bark Tortrix, *Eucosma woeberiana* (Schiff.). During these years the larvae occurred in considerable numbers tunnelling in the bark of the several fruit trees, and more especially in the confines of the bands.

The reason for the marked fluctuations in number over the years 1928–1939 is due chiefly to parasitism by Tachinid flies (Thompson, 1928). The type of ground vegetation in the immediate vicinity of these thirty-five standard

PLAN OF STANDARD FRUIT TREES UPON WHICH THE RECORDS OF EARWIG POPULATIONS WERE TAKEN.

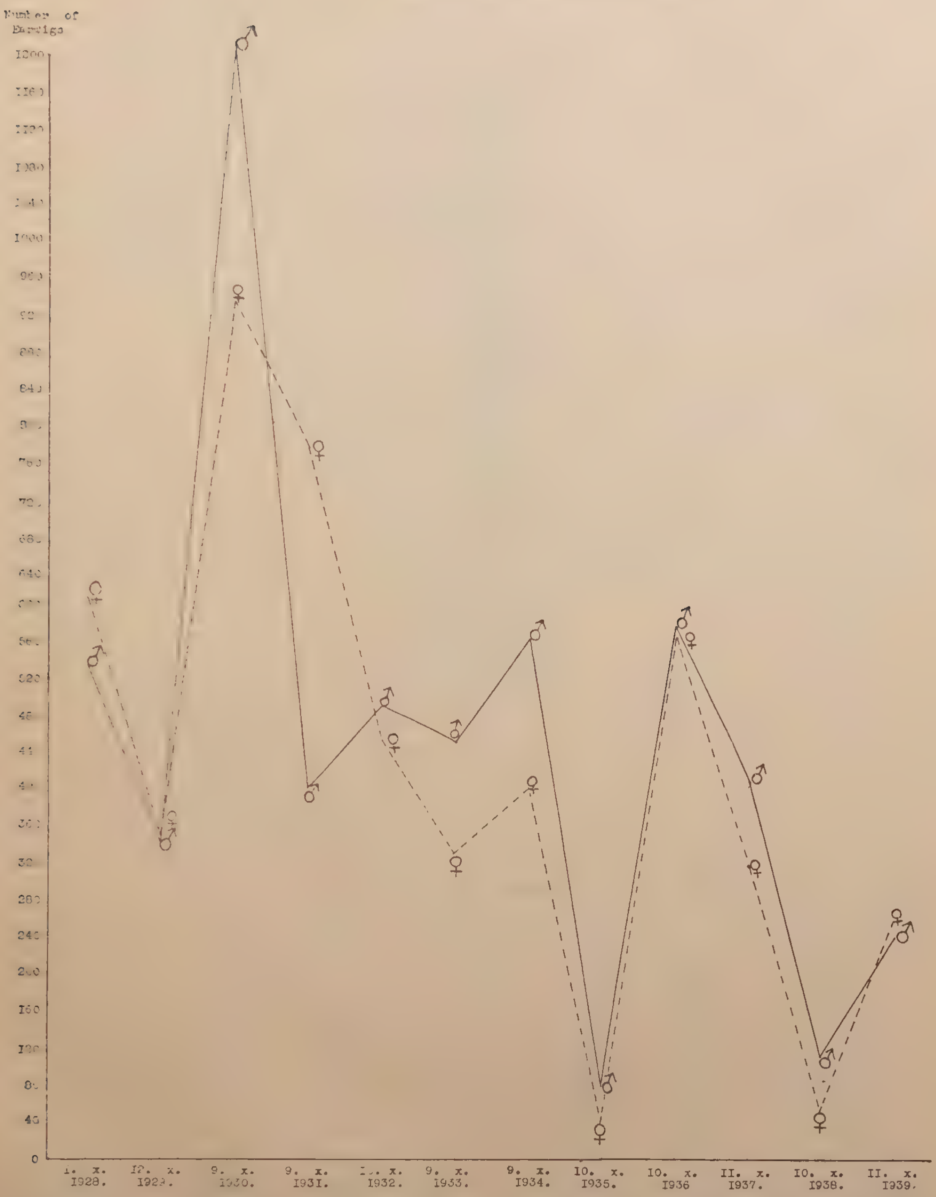


Fruit trees underplanted with Iris species, Pansies and Polyanthus.

fruit trees has remained constant (*vide* Plan), so that the food of the Earwigs existing in this area has been the same for some fifteen years. We have not observed any migration of Earwigs from or to this site from other areas at Wisley, and the marking of individuals supports this. Our observations do, however, show that there exists in the Wisley Gardens several distinct and separate colonisations with little or no contact one with the other.

An attempt was made to correlate the relationship between population figures and climatic conditions, but no significant relationship appears to exist and it is, therefore, unnecessary to provide meteorological data for the years in question.

My thanks are due to my colleague, Mr. F. C. Brown, for the photograph illustrating the assemblage of Earwigs in a bamboo cane.



Number of *F. auricularia* (♂♂, ♀♀) captured beneath Grease-bands, 1928–1939 (see Table I).

SUMMARY.

The gregarious habits of the Common Earwig, *F. auricularia* L., are considered, together with the sexual ratio of insects found sheltering beneath trap-bands on fruit trees.

The number of macrolabious forms found in the colonies is given.

The limiting factor affecting the population is one of parasitism, and climatic conditions do not appear to exercise any marked influence on the number of Earwigs.

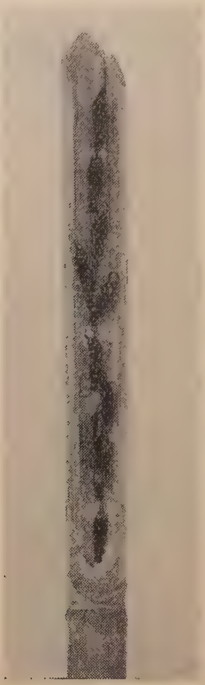


Fig. 1.—An assemblage of *Forficula auricularia* L. in internodal area of Bamboo support-cane.

Table I.

Date	♂♂, no.	♀♀, no.	♂♂, var. *forcipata*	♂♂, %	♀♀, %	Total
1.x.1928	534	619	11	46·7	53·3	1164
12.x.1929	349	355	3	49·8	50·2	707
9.x.1930	1207	932	9	56·6	43·4	2148
9.x.1931	410	784	1	34·4	65·6	1195
10.x.1932	499	466	8	52·1	47·9	973
9.x.1933	443	336	9	57·4	42·6	788
9.x.1934	557	406	16	58·5	41·5	979
10.x.1935	81	40	2	67·5	32·5	123†
10.x.1936	592	587	2	50·3	49·7	1181
11.x.1937	422	320	1	56·8	43·1	743
10.x.1938	117	56	1	67·8	32·2	174†
11.x.1939	247	266	2	48·3	51·7	515

References.

Burr, M., 1939, *Science Progress* **34** : 20–30.
Lucas, W. J., 1920, *Monograph of British Orthoptera* : 51–52.
Worthington, E. B., 1926, *Entomologist* **59** : 138–142.
Thompson, W. R., 1928, *Parasitology* **20** : 123–158.

ON THE OCCURRENCE OF MALES OF *RHODITES ROSAE* (L.) (HYMENOPTERA, CYNIPIDAE)

By E. McC. Callan, B.Sc., A.R.C.S., D.I.C., Ph.D., F.R.E.S.
(*Entomology Department, Imperial College of Tropical Agriculture, Trinidad, B.W.I.*)

Introduction and Methods Used.

The Cynipid genus *Rhodites* is represented in Great Britain by four species, the larvae of which cause galls of distinct and characteristic appearance on various wild roses. The most abundant species, *Rhodites rosae* (L.), produces the gall known as the robin's pincushion, moss gall or bedeguar. *R. eglanteriae* Htg. gives rise to the smooth pea gall, and *R. rosarum* Gir. the spiny pea gall. *R. spinosissimae* Gir., which is the rarest of the four species, produces a gall which may assume various shapes. *R. rosae* occurs throughout Europe and western Asia and also in North America. The other species are apparently confined to Europe.

The community of insects inhabiting the galls of the first three species was studied. During the autumn of 1934, 125 *R. eglanteriae* and 44 *R. rosarum* galls were collected, and an additional 85 *R. eglanteriae* galls during the autumn of 1935. These were obtained from various localities in south Buckinghamshire and from localities in Surrey and Cumberland.

A more detailed study was made of *R. rosae* galls, as it was possible to collect these in large numbers. The majority of *R. rosae* galls were collected during the winter of 1934–35, 1059 galls being obtained altogether. A few of these were collected as early as October and as late as April, but most of them, *i.e.* more than 82%, were collected in February and March. An additional collection of 79 galls was made during the winter of 1935–36. The majority of *R. rosae* galls were collected from 26 localities in south Buckinghamshire within 20 miles of Slough. Some galls, however, were collected from a number of localities in Hampshire, Surrey, Cumberland and Yorkshire.

It was found to be essential to collect galls only after the gall-feeding larvae were fully fed. The galls could then be stored and subjected to a certain amount of drying without harming the occupants. *R. eglanteriae* and *R. rosarum* galls were stored in 3-in. by 1-in. glass tubes either fitted with corks or capped with muslin. The smaller *R. rosae* galls were similarly stored, while the larger galls were kept in glass jars of various sizes capped with muslin. It was found to be an advantage to allow the galls to lie upon a layer of dry sand rather than directly on the bottom of the storage vessels. In this way, any slight amount of moisture collecting at the bottom of the vessels was absorbed by the sand, and insects appearing from the galls were always in a perfectly dry condition, which facilitated identification, and were never attacked by moulds. The tubes and jars containing the galls were stored in a small summer-house with a permanently open doorway on the south-west side. The conditions of temperature and humidity prevailing in this improvised insectary were found to approximate to those in the open air.

Only 815 of the *R. rosae* galls produced insects. In all 24,393 insects appeared as adults; 6007 of these were the gall-causing species and the remainder were inquilines and parasites. A number of males of *R. rosae* were obtained, although the great majority were females. No males of *R. eglanteriae* and *R. rosarum* were obtained from the small number of galls of these species collected.

Previous Records.

The *Rhodites* species occurring in Europe appear to be normally parthenogenetic and males are of extreme rarity. According to Kieffer (1914) males of *R. rosae*, *R. eglanteriae* and *R. spinosissimae* have been occasionally obtained. Males of *R. kiefferi* appear to be more abundant, while the existence of males of *R. rosarum* and *R. mayri* Schlecht. seems doubtful.

Kuznetzov-Ugamskij (1930) recorded a *Rhodites* sp. in Asia, in which the males are as abundant as the females, and parthenogenesis probably does not occur.

Kinsey (1920a) suggests that in some primitive *Rhodites* species in America normal sexual reproduction may take place, but in the genus as a whole the male sex is gradually disappearing, and in consequence parthenogenesis is becoming the sole means of reproduction. He gave the percentage of males in America as 0 for *R. bicolor* Harr., 1·5 for *R. rosae*, 8 for *R. dichlocerus* Harr. and 35 for *R. ignotus* O.S.

Cameron (1892) gave a brief description of the male of *R. rosae*, and stated that it is exceedingly rare in comparison with the female. Adler (1894) obtained 7 males out of a total of 671 insects. Kieffer (1914) reared the species for several years without obtaining a single male.

Hoffmeyer (1925) is of the opinion that the male occurs rarely in Germany. He quoted the records of Adler and Kieffer, and stated that Reinhard, in rearing hundreds of individuals over a period of 15 years, only obtained one male, and that according to Riedel the proportion of males to females is 1 : 100. Hoffmeyer obtained two males and at least 221 females from galls collected in Denmark. Some of the galls were collected late in the spring, so that some males may have already left the galls prior to collection. He repeated his experiments, collecting galls in two subsequent years from various localities in Denmark, and obtained altogether 137 males and 3288 females.

Picard (1926) also referred to the records of Adler, Kieffer and Reinhard, but made a mistake in saying that Adler obtained 7 males to 671 females, whereas 671 insects only were obtained altogether, of which 7 were males and 664 females. Picard pointed out that the results of Magretti, who claimed that in Italy the males were much more numerous than the females, cannot be accepted, as it is practically certain that the inquiline, *Periclistus brandti* Ratz., was mistaken for the male of *R. rosae*. As further suggesting that an error was made in identification, Picard showed that Magretti does not record the inquiline as occurring in Italy, which would otherwise be difficult to explain, as *P. brandti* is particularly abundant in southern Europe and is recorded from Italy by Tavares (1920). Picard acquired galls from various parts of Europe in order to obtain males, and stated that so considerable a number of females appeared that he gave up counting them. He obtained 4 males, however, although the number of females exceeded 2000.

Kinsey (1920b) stated that in America males and females are sometimes produced in about equal numbers, but other galls yield no males at all. His final average gave 1–2% of males, which agrees with observations made in Europe.

Dr. K. S. Dodds informs me (1938, *in litt.*) that he reared numerous females from galls in England without obtaining a male. In the U.S.A. he later obtained males from a number of galls, usually a gall which produced males only yielding this sex. This would suggest the occurrence of unisexual families, but is not in agreement with my results in England, in which one of nine male-producing galls yielded only males and the others females and males.

Males Reared from Galls in England.

The *R. rosae* galls produced females in great abundance and males extremely rarely, and there can be no doubt that the species is normally parthenogenetic. From 815 galls 6007 specimens of *R. rosae* were obtained; 46 of these were males and 5961 females. This gives the sex ratio as the proportion of males to females as 1 : 130 and the percentage of males as 0·8.

The males were obtained from only nine galls from various localities as shown in Table I.

TABLE I

Locality	No. of galls producing females	No. of galls producing males	No. of males obtained
Farnham Common, Bucks	121	3	30
Hitcham Park, Bucks	98	2	6
Littleworth Common, Bucks	38	1	3
Corhampton Downs, Hants	13	1	3
Hedgerley, Bucks	36	1	2
Stoke Common, Bucks	2	1	2

It is remarkable that the three male-producing galls from Farnham Common, Bucks, yielded a total of 30 males, two galls each producing 6 and the remaining one 18 males. No other galls produced more than 3 males per gall. The gall from Littleworth Common, Bucks, produced only males, all the other male-producing galls yielding females together with males. A second collection of galls was made from Farnham Common in the following year. The collecting of the previous year had reduced the *Rhodites* population in this locality, and only 26 galls were found as against 232 in the previous year. These galls unfortunately did not yield any males.

Galls were successfully obtained by encaging *R. rosae* females on shoots of *Rosa canina* L. growing in pots in a heated glasshouse. Twelve insects eventually appeared from these galls, and it is remarkable that one of these was a male (see Experimental breeding of *R. rosae*).

Table II shows the relative abundance of males and females, expressed as sex ratios and percentages of males, obtained by various authors.

TABLE II.

Country and author	No. of males and females	No. of males	Percentage of males	Sex ratio males : females
Germany: Adler (1894)	671	7	1	1 : 95
U.S. of America: Kinsey (1920)	419	6	1·5	1 : 69
Denmark: Hoffmeyer (1925)	3425	137	4	1 : 24
France, England, Italy, Denmark, Sweden: Picard (1926)	2000	4	0·2	1 : 500
England: Callan	6007	46	0·8	1 : 130

The majority of the males were found dead in the storage vessels some time after they had appeared from the galls, and their time of appearance is unknown. During the course of the investigation a large number of galls was dissected, and the larvae removed and kept in individual gelatin capsules in the laboratory. Five males were obtained from such larvae removed from two galls. Actually 309 adults were obtained by this method, 5 being males and 304 females. The date of emergence from the pupa of two of these males was 9 May and 7 June 1935, the other three emerging between these dates.

A number of galls was isolated from the main bulk of the collected material, and observed, usually daily, for the appearance of insects for a period of 14 weeks. One of the galls produced 6 males. One of these appeared on 9 June, three on 22 June and two on 28 June 1935. Females started to appear from these galls on 14 May and continued for 65 days until 17 July 1935. There was a very clearly defined peak of appearance on 1 July. This was thought to be determined by the first hot day of the year, which occurred 9 days previously on 22 June, when a maximum shade temperature of 29° C. (84·2° F.) was recorded. The times of appearance of the males were therefore distinctly earlier than the date of peak appearance of the females.

A number of specimens of reared *R. rosae* males have been placed in the collection at the British Museum (Natural History).

Experimental Breeding of *Rhodites rosae*.

Numerous attempts have been made to breed *R. rosae* on the wild rose. These have apparently not always been successful, for Dr. K. S. Dodds informs me (1938, *in litt.*) that he made repeated endeavours to breed this species, but did not observe oviposition and no galls resulted.

In 1935 the experimental breeding of this species was attempted on a small scale on plants of the wild rose, *Rosa canina* L., growing in pots in a heated glasshouse. Rose shoots bearing various numbers of buds were encaged in large glass tubes with the ends closed by muslin or cotton wool. Females reared from stored galls were introduced into these tubes and observations made of their behaviour.

Three individuals incubated from a gall were introduced on to a rose shoot on 15 February, 1935. They were somewhat sluggish, but were observed with their ovipositors inserted into buds and seemed to be engaged in egg-laying, remaining in this position for as long as 30 minutes at a time. The first definite signs of gall formation were not observed until 25th April, *i.e.* 70 days after the introduction of the insects. Two galls were produced, which were kept under close observation and developed rapidly, appearing fully formed on about 10th May, at a time when no galls are to be found under natural conditions in the field. No insects were obtained from these galls.

Further breeding experiments with females incubated from galls were carried out in May and June, and 21 galls in all resulted. Oviposition in the buds was frequently observed, and eggs were found within the buds on dissection. At this time of the year the first signs of gall formation were observed from 12 to 36 days after the introduction of the insects, gall formation being more rapid in breeding experiments in late May and June than those in early May. In a number of experiments no galls resulted.

From the 21 galls only 12 specimens of *R. rosae* were obtained, but it is remarkable that one of these was a male. This male developed from an unfertilised egg laid by a parthenogenetic female. As far as I am aware this attainment is without precedent for the species. It has always been regarded that *R. rosae* exhibits thelytokous parthenogenesis, in which the unfertilised eggs give rise solely to females. The production of this male from an undoubted unfertilised egg is of great interest, and demonstrates that the species shows amphitokous parthenogenesis, in which the unfertilised eggs give rise to either sex. Unfortunately no cytological examination of this male was made.

The females obtained were rather smaller than usual, and presumably unfavourable conditions had prevented the larvae from obtaining food sufficient for normal development. These conditions were doubtless responsible for so few galls yielding insects. The presence of a male may possibly be correlated with the conditions of semi-starvation in the gall. It would be of the greatest interest if this correlation between the production of males and unfavourable conditions existed in nature.

Geographical Distribution of Males.

The females of *R. rosae* occur apparently throughout Europe, their distribution being dependent, according to Harrison (1922), on that of their host-plant, the wild rose. Widely different sex ratios have been obtained in various parts of Europe, and it has been suggested that males may be more abundant in some regions than in others.

Hoffmeyer (1925) is inclined to the view that males may be more numerous in the north of Europe than in the south, as he obtained a higher percentage of males in Denmark than had previously been obtained in more southern countries.

Picard (1926), having previously obtained a certain number of males from Montpellier, France, was originally of the opposite opinion, believing that males might be more abundant in southern Europe. He obtained galls, therefore, from southern Italy, England, Denmark, Sweden and various parts of France, hoping to make a statistical analysis based on numbers sufficiently large to support or disprove his theory. Unfortunately he only obtained four males altogether, one of which came from Italy, another from France and the remaining two from Sweden. He concluded from his results that males are everywhere rare, as much in the south as in the north.

In many insects and other Arthropoda two distinct geographical races within a single species have been found to exist, one in which males are extremely rare or absent and reproduction is parthenogenetic and the other in which males are numerous and bisexual reproduction normally occurs. In most cases the parthenogenetic race is more northern in distribution than the bisexual race. Vandel (1931) has fully discussed this phenomenon, to which he originally gave the name geographical spanandry, but which he now terms geographical parthenogenesis.

On the examination of my results in conjunction with those of other authors, it is difficult to draw any conclusion other than that the males are rare wherever they have been found. If anything, some slight support is given to the view that males are more abundant in the north than in the south. It would be necessary to make a careful analysis of the numbers of males and females, obtained from a large number of galls from all parts of Europe, before it could be shown whether or not this is true.

In the more primitive CYNIPIDAE the males and females are equally abundant, and the more or less complete disappearance of males in *R. rosae* and other specialised forms is a secondary phenomenon, consequent upon the development of parthenogenesis in the females. If males were actually more numerous in the north than in the south, speculations might be made as to whether this retention of a more primitive condition would be of any advantage to the species living in northern latitudes. It seems certain, however, that *R. rosae* is everywhere parthenogenetic and does not exhibit any form of geographical parthenogenesis.

Summary.

From 815 bedeguar galls from England 6007 specimens of *Rhodites rosae* (L.) were obtained; 46 of these were males and 5961 females, the sex ratio being 1 male : 130 females and the percentage of males 0·8.

The times of appearance of the males from the galls were distinctly earlier than the date of peak appearance of the females.

In breeding experiments a single male developed from an unfertilised egg, demonstrating that the species exhibits amphitokous parthenogenesis.

Males are rare wherever they have been found. It seems certain that the species is everywhere parthenogenetic and does not exhibit any form of geographical parthenogenesis.

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I wish to express my deep indebtedness to Professor J. W. Munro and Dr. O. W. Richards, under whose supervision the work was carried out, for their interest, advice and constructive criticism during the progress of the investigation.

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BOOK NOTICE.

Destructive and Useful Insects. Their habits and control. By C. L. METCALF and W. P. FLINT. 8vo. London (McGraw-Hill), 1939. Second edition. pp. xvi + 981, 584 figs. Price 50*s*.

In 1928 appeared the well-known work *Destructive and useful insects* and in the decade which has elapsed since its appearance such sweeping change has taken place in entomological practice that it has been found necessary to revise the work completely so that it has in fact been re-written. This has resulted in about twenty per cent. more material being provided than was the case in the first edition.

One of the new additions is the attempted key to the identification of the immature stages of the orders of insects.

The 23 chapters of the book are entitled : insects as enemies of man; the value of insects to man; the external morphology of insects; the internal anatomy and morphology of insects; the mouth parts of insects; development and metamorphosis; the place of insects in the animal kingdom; the orders of insects; insect control; apparatus for applying insecticides; insects injurious to corn and related crops; insects injurious to small grains; insects injurious to legumes; cotton insects; tobacco insects ; insects injurious to vegetable gardens and truck crops; insects injurious to deciduous fruits and bush fruits; citrus insects; insects attacking shade trees and shrubs; insect pests of greenhouse plants and the flower garden; household insects and pests of stored grains, seeds, and cereal products; insects injurious to domestic animals; insects that attack and annoy man and affect his health.

A noteworthy feature of the book is the great assistance offered to the reader by the provision of many tables, synopses, keys, and field keys. The field keys are presented under the heading of the affected crop.

The index extends to more than 70 pages of double-column matter.

BOOK NOTICE.

The Moths of the British Isles. By R. SOUTH. Edited and revised by H. M. EDELSTEN. 2 Volumes. 8vo. London (F. Warne & Co.), 1939. Price 10*s*. 6*d*. each volume.

The standard work of its kind in this country is South's *Moths and Butterflies* originally published in 1907 and 1908 and re-issued at frequent intervals. Its appearance as a new and revised edition will be welcome to many.

Perhaps the most obvious change in the book is the introduction of a more modern nomenclature for the species and genera.

The popularity of the book, which is proved by its long life as a standard work, has doubtless been the cause of the absence of any change in the general lay-out and presentation. The many coloured illustrations are still given for the benefit of the reader and a welcome addition is the provision of more extensive indices.

To each volume is appended an Appendix which brings the subject matter right up to date. On page 336 of volume 1 is described a new aberration " for which we propose [the name] ab. *aeruginis*." It is nowhere stated who " we " are. As, however, the title-page states that Mr. H. M. Edelsten is responsible for the revision, he should be cited as the author of this new aberration.

BOOK NOTICE.

Working with Nature. By E. KING and W. PESSELS. pp. xviii + 181, 60 figs. 8vo. New York and London (Harper Bros.) (1939). 6*s*.

This is a book on the conservation of wild life approached from the ecological standpoint. It is of popular appeal, and opens with an attempt to capture the reader's imagination by presenting familiar everyday creatures in a new light. A large part of the book concerns the insects. The chapters are entitled : What's going on in your dooryard ? ; In debt to the insects ; Butterflies and moths ; Beetles ; In Pond and Brook ; Knowing the birds ; Saving the ducks ; What the fur-bearers mean to us ; The beaver—our first conservationist ; Our big game. There is an appendix on further aids to conservation, with a list of books to read.

BOOK NOTICE.

Les Guêpes. By L. BERLAND. sm. 8vo. Paris (Éditions Stock) (Les Livres de Nature), 1939. pp. 166 + [i]. Price 18 francs.

This work of popular appeal is divided in two parts. The first deals with solitary wasps and the second with social wasps.

The six chapters of the first part deal with : the life of the wasp ; the work of wasps ; the prey of wasps ; paralysis of prey by wasp poison ; fixity of instinct ; wasps which exploit others.

The three chapters of the second part deal with : the communities of wasps ; wasp nests and how they are made ; the feeding of wasps.

BOOK NOTICE.

A Laboratory guide in Entomology for introductory courses. By R. MATHESON. 4to. Ithaca (Comstock Publishing Co.), 1939. pp. vii + 135, 54 figs. Price $2.00.

This book is by a Professor of Entomology at Cornell University and is based largely on the work offered in the " beginning course in Entomology at Cornell University."

The book is divided in twenty-eight chapters, with an Appendix on how to collect, prepare, preserve, mount and rear insects, and a glossary.

The book is so made as to be particularly suitable for its purpose of a laboratory guide since each page may be easily detached by tearing along the perforations at the back. A series of larger holes is presumably supplied to enable the pages torn out to be returned to their place in the book. The book is bound in a semi-stiff cardboard cover.

A noteworthy feature of the work is the large number of line drawings provided, many of them being printed on one side of the paper only.

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,,	October	2	5.0 p.m.
,,	November	6	5.0 p.m.
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